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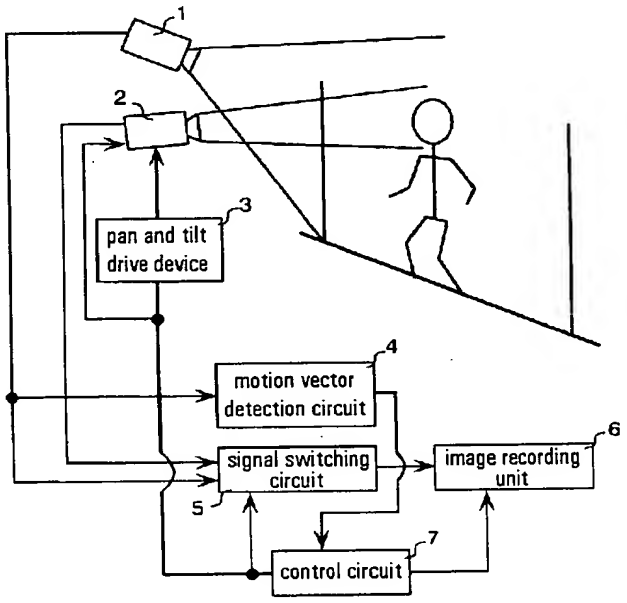
Title Monitoring System

Abstract

TASK: It is an object of this invention to provide a monitoring system capable of easily recording facial images, which are important for confirming identity.

SOLUTION: The invention comprises monitoring camera 1 for capturing images of an entire monitoring area, and close-up camera 2 for capturing a close-up image of a person's facial portion. The person's movements are detected by motion vector detection circuit 4 on the basis of images from the monitoring camera, control circuit 7 switches signal switching circuit 5 in accordance with these motion vectors, and images from close-up camera 2 are recorded in image recording unit 6.



Claims

1. A monitoring system characterised in that it captures an image of a monitoring area with a monitoring camera, and when movement of a body within this monitoring area is detected, it captures an image of at least a portion of the moving body. [1]*

2. The monitoring system according to Claim 1, characterised in that it captures an enlarged image of said portion of the body.

3. A monitoring system characterised in that it comprises a monitoring camera for capturing an image of an entire monitoring area, and a close-up camera for capturing an image of a portion [2] in close-up; and in that it outputs an image from the close-up camera when movement of a body is detected on the basis of the image from the monitoring camera.

4. The monitoring system according to any of Claims 1 to 3, characterised in that it comprises an image recording means for recording images within the monitoring area; and further characterised in that it switches the image supplied to the image recording means when movement of a body within the monitoring area is detected.

* Numbers in square brackets refer to Translator's Notes appended to the translation.

5. The monitoring system according to Claim 4, characterised in that the fact that movement has been detected is recorded along with the image.

6. The monitoring system according to Claim 4 or 5, characterised in that said image recording means plays back images of a moving portion more slowly than the playback speed of other portions.

7. The recording system according to any of Claims 1 to 3, characterised in that it comprises an image recording means for recording images within the monitoring area, and in that it records images in the image recording means when, and only when, it has detected movement of a body within the monitoring area.

Detailed Description of the Invention

Technical field of the invention

(1) This invention relates to monitoring systems suitable for installation in convenience stores, banks and so forth.*

Prior art

(2) Video cameras for monitoring for crime prevention purposes are installed in convenience stores, banks and so forth, and the images captured by such video cameras are recorded on video devices and utilized in criminal investigations.

Problems that the invention will solve

(3) However, in conventional systems, because the image of an entire monitoring area is captured and recorded, there have been cases where it has been impossible to satisfactorily recognise the face of the suspect that has been recorded on the video equipment when for example a crime has been committed.

(4) Other difficulties that have been encountered are that because the image is continually being recorded on the video equipment even when there are hardly any people present, such as during the night, enormous amounts of video tape or the like are used and considerable time is required to carry out subsequent searching.

(5) This invention has been devised to solve these previously encountered problems, and it is an object of the invention to provide a monitoring system whereby the recording of facial images, which are important for confirming identity, is easy.

Means for solving problems

The monitoring system of this invention is characterised in that it captures an image of a monitoring area with a monitoring camera, and when movement of a body within this monitoring area is detected, it captures an image of at least a portion of the moving body.

(6) The invention is preferably constituted so that it captures an image of this portion of the body in close-up.

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* Numbers in round brackets at the beginning of paragraphs correspond to the paragraph numbering in the Japanese patent document. (However, note that in the Japanese document there is an unnumbered paragraph between paragraphs 5 and 6.)

(7) The monitoring system of this invention is also characterised in that it comprises a monitoring camera for capturing an image of an entire monitoring area, and a close-up camera for capturing an image of a portion in close-up; and in that it outputs an image from the close-up camera when movement of a body is detected on the basis of the image from the monitoring camera.

(8) Given the constitution described above, when motion is detected due for example to movement of a person within this monitoring area, the portion that has moved is supplied as data, and therefore it is easy to identify the body of the person, etc. In particular, identification becomes even easier if an image is captured in close-up.

(9) The invention is preferably constituted so that it comprises an image recording means for recording images within the monitoring area; and so that it switches the image supplied to the image recording means when movement of a body within the monitoring area is detected.

(10) By recording a close-up of the person, etc. on the image recording means, identification of the person, etc. can easily be accomplished in subsequent searching.

(11) The invention is also preferably constituted so that the fact that movement has been detected is recorded along with the image.

(12) By recording, along with the image, the fact that movement has been detected, searching can be easily be carried out.

(13) The image recording means is also preferably constituted so that it plays back images of a moving portion more slowly than the playback speed of other portions.

(14) By playing back non-moving portions at a higher speed, search time can be shortened.

(15) The invention can also be constituted so that it comprises an image recording means for recording images within the monitoring area, and so that it records images in the image recording means when, and only when, it has detected movement of a body within the monitoring area.

(16) By recording in conjunction with motion extraction, recording capacity can be extended.

Embodiments of the invention

(17) Embodiments of this invention will now be described with reference to the drawings.

(18) FIG. 1 is a functional block diagram showing a monitoring system according to a first embodiment of this invention. As shown in FIG. 1, one or more than one monitoring video camera 1 for capturing an image of an entire area is installed in a monitoring area such as an entranceway or inside a premises, and the monitoring area is monitored by means of this monitoring video camera 1. Close-up video camera 2 for capturing close-up images of the facial portion of an individual is also installed. This close-up video camera 2 is adapted so that it can be moved up and down and left and right by means of pan and tilt drive device 3, and so that it can be directed towards a target portion for image capture. This close-up video camera 2 also has an autofocus function so that it can output captured images of the target as sharp image data.

(19) The image data from monitoring video camera 1 and close-up video camera 2 are sent via signal switching circuit 5 to image recording unit 6 which can for example be video equipment.

(20) The image data from monitoring video camera 1 is also applied to motion vector detection circuit 4.

(21) This motion vector detection circuit 4 [3] detects motion vectors on the basis of image data supplied from monitoring video camera 1. Specifically, it detects a motion vector by superimposing the current image and the image a prescribed number of frames later (e.g., 1 frame later) and then finding the amount by which a detection region within one of the images has to be shifted in order for the two image portions to coincide. All-point matching and representative point matching are among the methods that can be used to detect a motion vector. For example, if representative point matching is used, attention is directed to several pixels — i.e., to representative points — on the monitoring area screen image supplied from monitoring video camera 1, and the motion vector is determined from these pixels. As shown in FIG. 3, the brightness level at a representative point in the current frame is written to memory and compared with the brightness level of each pixel (1)–(9) in the detection area of the immediately following frame. It is decided that the representative point has moved to the position of the pixel with the closest brightness level match, and the difference between this point and the representative point is computed as the motion vector.

(22) The output from motion vector detection circuit 4 is applied to control circuit 7 comprising a microcomputer, etc. Control circuit 7 decides, on the basis of the output of motion vector detection circuit 4, whether or not a person has moved into the monitoring area, and performs drive control of pan and tilt drive device 3, thereby controlling close-up video camera 2. It also controls signal switching circuit 5.

(23) As has been described above, the monitoring area is monitored by monitoring video camera 1, and if a person moves within this monitoring area, motion vector detection circuit 4 computes and outputs the motion vectors. Control circuit 7 decides, in accordance with the motion vectors from motion vector detection circuit 4, whether or not a person has moved. If it decides that a person has intruded into the monitoring area, it switches the image data that is supplied to image recording unit 6, to the image data from close-up video camera 2. That is to say, when there is no movement of a person within the monitoring area, image data from monitoring camera 1 is supplied to image recording unit 6 and the image of the entire monitoring area is recorded.

(24) If control circuit 7 decides, in accordance with the motion vectors from motion vector detection circuit 4, that a person has moved, it causes pan and tilt drive device 3 to operate and thereby directs close-up video camera 2 towards the position where the person is present. Specifying this position where the person is present is a matter of data from the entire monitoring area being supplied to motion vector detection circuit 4 by means of monitoring camera 1, whereupon control circuit 7 predicts the position of the person on the basis of this data and directs close-up video camera 2 accordingly. Control circuit 7 then causes close-up video camera 2 to operate, obtain a close-up of the facial portion of the person, and record this image in recording unit

6. Control may be performed so that this close-up image is recorded for a prescribed length of time, and so that the close-up image is recorded while camera 2 is moved so as to track the movements of the person. It is also desirable, when recording image data for close-ups, to simultaneously record a flag or the like in a manner that is convenient for subsequent searching, so that the recorded image can be distinguished from the general video.

(25) If motion vectors cease being output from motion vector detection circuit 4 and applied to control circuit 7 — i.e., if there is no longer any person within the monitoring area — control circuit 7 switches signal switching circuit 5 so that the image data from monitoring camera 1 for observing the entire monitoring area is supplied to image recording unit 6.

(26) As has been described above, a monitoring area is monitored by monitoring video camera 1, and if a person moves within this monitoring area, the facial portion of the person that has been captured by a video camera 2 for close-ups is recorded clearly in image recording unit 6, and therefore identification of individuals is easy.

(27) FIG. 2 is a functional block diagram showing a monitoring system according to a second embodiment of this invention. The embodiment shown in FIG. 2 is constituted so that it captures images of an entire monitoring area and also captures close-up images of a face with a single video camera 1a. To achieve this, video camera 1a has a zoom function.

(28) Video camera 1a having a zoom function is installed in the monitoring area and monitors this area after adjusting its zoom to a wide-angle setting. Video camera 1a is fitted with pan and tilt drive device 3 for directing the video camera towards a person when the camera is in close-up mode. Video camera 1a is moved up and down and left and right by means of this pan and tilt drive device, and is thereby directed towards a target portion for image capture. Video camera 1a also has an autofocus function so that it can output a sharp image of the target object.

(29) Image data from video camera 1a are sent to image recording unit 6 (video equipment or the like) where they are recorded.

(30) Image data from video camera 1a are also supplied to motion vector detection circuit 4 as in the previously described first embodiment.

(31) This motion vector detection circuit 4 detects motion vectors on the basis of image data supplied from video camera 1a. Specifically, it detects a motion vector by superimposing the current image and the image a prescribed number of frames later (e.g., 1 frame later) and then finding the amount by which a detection region within one of the images has to be shifted in order for the two image portions to coincide.

(32) The output from motion vector detection circuit 4 is applied to control circuit 7 comprising a microcomputer etc. Control circuit 7 decides, on the basis of the output of motion vector detection circuit 4, whether or not a person has moved into the monitoring area, and performs drive control of pan and tilt drive circuit 3, and of the zoom mechanism of video camera 1a.

(33) As has been described above, the monitoring area is monitored by video camera 1a, and if a person moves within this monitoring area, motion vector detection circuit 4 computes and outputs motion vectors. Control circuit 7 decides, in accordance with

the motion vectors from motion vector detection circuit 4, whether or not a person has moved. If it decides that a person has intruded into the monitoring area, it causes pan and tilt drive device 3 to operate, directs video camera 1a towards the position where the person is present, employs the zoom mechanism to obtain a close-up of the facial portion of the person, and causes this image to be recorded in image recording unit 6 for a prescribed length of time. It is also desirable, when recording image data for close-ups, to simultaneously record a flag or the like in a manner that is convenient for subsequent searching, so that the recorded image can be distinguished from the general video.

(34) If motion vectors cease being output from motion vector detection circuit 4 and applied to control circuit 7 — i.e., if there is no longer any person within the monitoring area — control circuit 7 causes the zoom mechanism and pan and tilt drive device 3 to operate so that a video signal for observing the entire area is supplied to image recording unit 6 from video camera 1a.

(35) As has been described above, a monitoring area is monitored with a single video camera 1a, and if a person moves within this monitoring area, the facial portion of the person that has been captured in close-up by the zoom mechanism is recorded in sharp detail in image recording unit 6, and therefore identification of individuals is easy.

(36) In both of the embodiments described above, images of the overall monitoring area and close-up images are both recorded by recording unit 6 after being switched. However, an alternative constitution that economises on videotape would be to record images only when there is movement — in other words, only when motion vectors are output from motion vector detection circuit 4.

(37) Searching can be performed extremely easily if the following constitution is adopted. Namely, in cases where a flag is recorded — as in the foregoing embodiments — so that close-up images, i.e., images resulting from detected movement, can be distinguished in the output of images from image recording unit 6: if a flag is not detected, high-speed playback is employed, whereas if a flag is detected, playback is at standard or low speed.

(38) Alternatively, if a flag or the like is not recorded, a motion detection circuit can be provided in the image recording and playback unit. Then, when motion vectors are not output, this motion detection circuit ensures that high-speed playback is employed, and when motion vectors are output, it ensures that playback is at standard or low speed. Note that if such a constitution is adopted, standard or low speed playback of the first frame after movement has occurred is not possible. However, the inability to play back one frame at a standard or low speed is not a problem, since one frame has a duration of only 1/60 second.

Effect of the invention

(39) As has been described above, when movement of a person or the like occurs, this invention enables close-up images of a portion of that person etc. to be recorded, and therefore facilitates identification of an individual.

Brief Description of the Drawings

FIG. 1 is a functional block diagram showing a monitoring system according to a first embodiment of this invention.

FIG. 2 is a functional block diagram showing a monitoring system according to a second embodiment of this invention.

FIG. 3 is a schematic drawing illustrating the concept employed in a motion vector detection device.

Key to referencing numerals

1.....monitoring video camera
2.....close-up video camera
3.....pan and tilt drive device
4.....motion vector detection circuit
5.....signal switching circuit
6.....image recording unit
7.....control circuit

FIG. 1

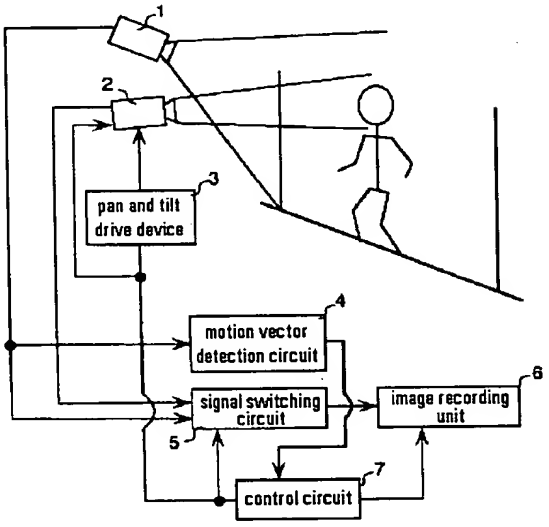


FIG. 2

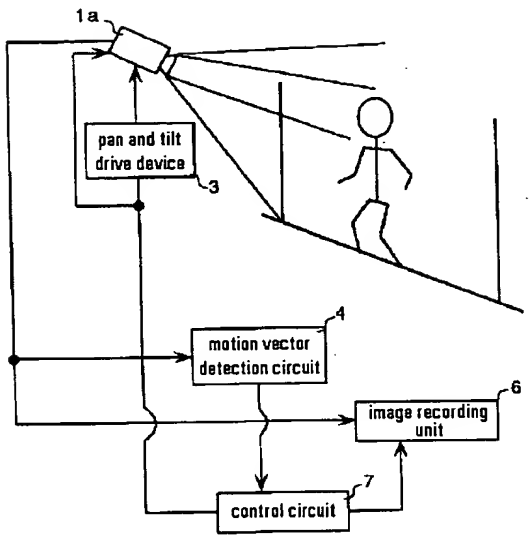
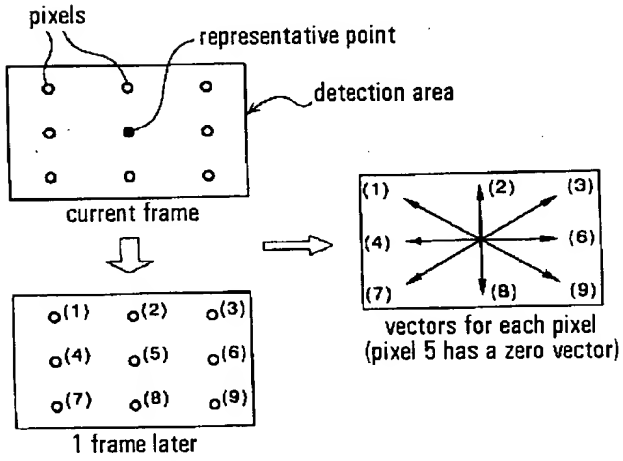


FIG. 3



TRANSLATOR'S NOTES

1. The Japanese which I have translated as "it captures an image of at least a portion of the moving body" is ambiguous, and could also be translated as "it captures an image of at least the moving portion of the body".

2. Sic. Although not made explicit in the claim, the writer presumably means, by "a portion", a portion of the entire monitoring area.

3. The Japanese erroneously reads "This motion vector detection circuit 2... ". I have made the necessary correction.